

## Geometric-2 FCC Application

### Form 442 Question 6: Description of Research Project (Summary)

#### Nature of the research project being conducted:

**Mission Overview:** GEOMETRIC-2 is a train constellation rideshare mission, consisting of two ~10 kg 6U class satellites (NOCLIP-1 and MOXY-1) using a common spacecraft bus intended to reach a stable low altitude (~550 km) high inclination (~89 degrees) Sun Synchronous Orbit lunar Orbit (SSO) on the SpaceX Transport 8 Launch (NET June 2023) and operate for up to two years.

The GEOMETRIC-2 mission entails the design, integration, launch, deployment to a stable Earth orbit, and operation of a train constellation of two (2) 6U CubeSat spacecraft buses and accompanying payloads conducting applications and related radio experiments. The Geometric-2 constellation constituent satellites are:

- **NOCLIP-1** Technology Development, Demonstration and Deployment focused on sharing the Overview Effect sensory experience through Virtual Reality. NPOCLIP-1 is a 6U CubeSat equipped with a wide field 4K resolution camera optimized for the sensory experience.
  3. Imaging system payload capable of streaming a 4K resolution video virtual reality image of the Earth as viewed from Low Earth Orbit.
  4. Interoperable Network Communications Architecture (INCA) Virtual Reality sensory application -- provides a ***source of continuous high rate data*** (4K resolution streaming video) interacting with the spacecraft Software Defined Radios. Using a combination of onboard computational capacity and ground based mission/payload operations control resources near real-time radio link Quality of Service (QoS) characterization in terms of performance, availability, and security will be performed. The resulting data will be correlated the near real-time state model of the end-to-end communications system. This is intended to further advancement of radio technologies enabling dynamic (rather than scheduled) allocation of communication resources and the evolution to INCA by testing systems with customer applications (i.e.,real world requirements).

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- **MOXY-1** Technology Development, Demonstration, and Deployment mission focused on Distributed Ledger Technology & Imaging. MOXY-1 is a 6U CubeSat equipped with internal imaging sensors and screen to display and share/advertise digital tokens in space.
  1. Distributed Ledger Technology and Imaging (DLT&I) Payload -- Demonstration of DLT&I technology enabling processing of distributed public ledger transactions in space and their visualization as sharable digital tokens.
  2. Interoperable Network Communications Architecture (INCA) Transaction Processing and Visualization application -- provides a source of transaction data and related image products with high QoS requirements interacting with the spacecraft Software Defined Radios. Using a combination of onboard computational capacity and ground based mission/payload operations control resources near real-time radio link Quality of Service (QoS) characterization in terms of performance, availability, and security will be performed. The resulting data will be correlated the near real-time state model of the end-to-end communications system. This is intended to further advancement of radio technologies enabling dynamic (rather than scheduled) allocation of communication resources and the evolution to INCA by testing systems with customer applications (i.e.,real world requirements).

#### **Necessity of the communications facilities for the research project:**

The Geometric-2 mission operations requires spacecraft bus telemetry and payload data to be received from the spacecraft as well as spacecraft bus and payload commands sent to the spacecraft. Without the capability to accommodate these transmissions the Geometric-2 spacecraft could not function as intended. More specifically it could not be commanded nor would there be a way to obtain the payload and correlateable spacecraft bus data. Existing communications facilities are inadequate for the research project. There is no other available space borne transmitter that will be accessible to the Geometric-2 mission to support mission operations. The Geometric-2 mission intends to use the existing AWS Ground Station Network for: S Band communications (tracking, telemetry, and commands) as the primary Earth Station nodes for uplink and downlink and X-Band for payload data downlink.